



Module 6: Agri-Systems Across the City-Rural Gradient

Optional Extended Learning

Circular Agri-Systems in Urban Environments

Activity Worksheet: Optimize Your Compost System

Grouping: Pairs or small groups (3–4)

Time: 25-30 minutes

Materials:

- Printed diagram of compost pile zones (aerobic surface, anaerobic pockets, leachate layer)
- One-page article summary: “Composting in Closed-Loop Urban Agriculture”
- Markers / poster paper or digital whiteboard tool
- Quick-reference chart of compost gases and their sources (CO₂, CH₄, NH₃, VOCs)

Objective:

To evaluate how specific composting practices impact greenhouse gas emissions and environmental safety. Students will design intervention strategies and explain their chemical effects within a working compost system.

Instructions:

1. On the compost diagram, mark 2 major problem areas where emissions / risks occur (e.g., low oxygen, too much nitrogen, odors)
2. Choose 3 management strategies to improve the system (e.g., mix materials, balance inputs, add filters)
3. Show on the diagram where each strategy works and how it changes the flow of gases or nutrients
4. In 1–2 sentences each, explain what process changes and how it makes the system safer or more sustainable

Your Task:

Design an improved compost system that reduces harmful emissions:

- Mark on the diagram where your interventions would occur
- List at least 3 management strategies (e.g. maintaining moisture, adding bulking agents, using biofilters)
- Explain how each strategy changes the gas pathways (e.g. reduces anaerobic pockets → CH₄)

Step 1: Identify Two Problem Zones

- Anaerobic pockets (CH₄ + VOCs)
- Excess nitrogen (NH₃ volatilization)
- Leachate and runoff
- Odor & pathogen risk

Step 2: Choose Three Management Strategies

- Add bulking agents (wood chips, straw) → improves aeration
- Monitor moisture → prevents anaerobic pockets
- Adjust C/N ratio → balances microbial activity
- Add biochar → adsorbs NH₃ and reduces leaching
- Install biofilter → scrubs odor & VOCs

Step 3: Map Interventions

On your compost diagram, show:

- Draw arrows for gas pathways (CO₂, CH₄, NH₃)
- Show your intervention points (where your chosen strategies act)
- Label each intervention point (e.g. “biofilter here”, “bulking agents here”)

Step 4: Explain the Chemistry

Pick one key strategy and explain in 1–2 sentences:

1. What chemical/biological process is changed?

2. Why does this lower emissions or improve safety?

Step 5: Prepare Your Pitch

Prepare a 1-minute group explanation of:

1. Where you intervened in the compost pile:

2. How your strategies reduce harmful gas:

Reflection Prompt:

How did urban constraints (space, energy, transport) affect your compost reuse model? What part of the loop (carbon, nutrient, water) was most difficult to close?

Skills You'll Use:

- Systems thinking
- Linking biology & chemistry to sustainability
- Visual communication of interventions
- Critical evaluation of environmental trade-offs

Example:

- Anaerobic pockets → add straw for aeration → more O₂ = microbes produce CO₂ (less harmful) instead of CH₄
- Excess nitrogen → adjust C/N ratio and add biochar → keeps N in compost, less NH₃ lost to air
- Odor & VOCs → biofilter layer of wood chips → traps smelly gases and pathogens.